DOCUMENT RESUME

ED 159 631 CS 004 363

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TITLE Effects of Noise on Reading Comprehension and Task Completion Time. Final Report.
INSTITUTION Missouri Univ., Columbia. Dept. of Practical Arts and Vocational-Technical Education.
SPONS AGENCY Missouri State Dept. of Elementary and Secondary Education, Jefferson City.
BUREAU NO 2279
PUB DATE 3 Apr 78
NOTE 7p.

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Classroom Environment; *Performance Factors; *Reading Comprehension; *Reading Research; School Shops; Secondary Education; *Vocational Agriculture; *Vocational Education
IDENTIFIERS *Noise

ABSTRACT

To determine the effects of noise intensities found in vocational shops and laboratories on student reading comprehension and task completion time, a study was conducted involving 9[illegible] students from 6 schools. The students were randomly assigned to either a control group or an experimental group and given the task of reading and answering questions. The control group worked under quiet classroom conditions of approximately 55 decibels while the experimental group worked under conditions of 110 decibels, a noise level often found in a vocational laboratory. The findings of the study indicated that as noise intensities increased, reading comprehension decreased and the time required to complete the assigned task increased. These findings suggest that vocational instructors should take measures to reduce noise levels in shops and laboratories. (JL)

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ED159631

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FINAL REPORT

Project No. 2279

EFFECTS OF NOISE ON READING COMPREHENSION AND TASK COMPLETION TIME

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April 30, 1978

C 004 363

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EFFECTS OF NOISE ON READING
COMPREHENSION AND TASK COMPLETION TIME

I. Statement of the Problem

Research over the past five decades has produced a mass of conflicting and contradictory reports as to the effects of noise upon human performance. The three major viewpoints which have been presented are that noise has a detrimental effect, noise has no effect, and noise has a facilitating effect. A wealth of information is available concerning the environmental quality of industrial settings. Much of the research has been conducted following the passage of the Williams-Steiger Occupation and Health Act of 1970 (85 Stat. 1593, 1600), commonly referred to as OSHA. The expressed purpose of the law is "to assure as far as possible every working man and woman in the nation safe and healthful working conditions and to preserve our human resources . . ." (USDOL, 1972).

On the other hand, there is a dirth of information which is available concerning the environmental quality of public school settings. Research by Bear (1969) and Shell (1972) have documented that vocational training laboratories very frequently operate with sound intensities in excess of the acceptable noise levels established by OSHA standards. W. S. Clark (1974) conducted a study analyzing the noise generated by the radial arm saw and its relationship to communications between students and teachers. Students reported that they could not hear while the radial arm saw was operating. W. F. Bear and W. S. Clark (1975) in a paper presented to the Central States Seminar recommended that researchers should seek solutions to noise, possibly redesigning the shop interior to control sound pressures.

There is a lack of precise information about the effects of noise on student performance in vocational agriculture laboratories. Therefore, the

problem to which this study was directed stemmed from a concern about the environmental quality within vocational shops and laboratories in Missouri public schools. The focus of the study related specifically to that of noise intensities.

II. Purpose of the Study

The purpose of this study was to compare the effects of two different noise intensities on the cognitive performance of students. More specifically, the investigation attempted to answer the following research questions:

1. What are the effects of noise intensities typically found in the vocational shops and laboratories on the ability of the student to function in the learning process.
2. What are the effects of noise intensities typically found in the vocational shops and laboratories on the student with reference to abilities associated with task completion time.
3. What recommendations should be established in regulating the noise intensity aspect of the environmental quality within vocational shops in Missouri.

The following objectives were identified and completed in the conducting of the research project.

1. To identify and review materials which relate to the evaluation of the effects of noise on the learning process.
2. To determine to what extent the time required for the completion of a task is affected by increasing sound intensity.
3. To recommend appropriate considerations for the control of noise pollution in vocational shops and laboratories.

III. Population, Sample and Procedures

The population included the 234 schools in Missouri that offer vocational agriculture courses as a part of their curriculum. The sample consisted of 94 students enrolled in plant science courses from six schools which were selected at random from the 234 offering vocational agriculture in Missouri. Students

at each center were randomly assigned to two groups, a control group and an experimental group.

This study was conducted as a posttest only control group experiment utilizing a 2 x 2 factorial design. The design required random assignment of the sample to two treatment groups to provide control of the threats to validity. Treatment involving group one, the control group, was conducted under quiet classroom conditions of approximately 55 decibels [dB(A)]. The treatment involving the second group, the experimental group, was conducted under a classroom condition with a noise level of 110 dB(A). The latter level was typical of that found in the vocational agriculture laboratory when students were grinding metal or using the radial arm saw to crosscut lumber. The students in each group were administered the task of reading and answering particular questions dealing with a project plan typical of the projects developed by the students enrolled in the plant science course. The production of the experimental material followed an iterative procedure of 1) development, 2) try-out, 3) analyze statistically, 4) validate with expert committee, 5) review, 6) revision and 7) pilot study.

Following the collection of the data, the scores were coded and prepared for analysis. An analysis of variance was performed on the comprehension and task completion time scores.

IV. Findings, Conclusions and Recommendations

The process of determining the kinds and levels of noise to be used, the methods of noise introduction and measurement, and the means of noise analysis required field work, consultation with sound experts and a review of previous research. Methods described by earlier researchers, and considered by them as satisfactory, were also investigated and used as far as was possible. After a

search of the literature had been conducted, a field survey of noise levels present in a functioning school that was in session was undertaken. To familiarize the reader with the noise levels in a variety of settings, estimations of typical levels of noises are presented in Table 2. These data were taken from work by Peterson and Gross.[1]

Table 2

Typical Sound Pressure Levels in Selected Settings

Source of environment	Distance in feet from source	Approximate SPL in decibels
50 HP siren	100	135
Hydraulic press	3	130
Jet engine test control room		110-115
Subway train	20	90-100
Heavy traffic	50	80
Average conversational speech	3	65
Average residence		45
Sound studio		20

Following are the conclusions that were formulated as a result of the findings of this study:

1. There was a significant difference in the group mean scores for reading comprehension at different sound intensities. The students completing the reading test in the environment with a noise level of 55 dB(A) did significantly better than the students completing the same test in the environment with a noise of 110 dB(A).

[1]A. P. G. Peterson and E. E. Gross, Jr., Handbook of Noise Measurement (fifth edition; West Concord, Massachusetts: General Radio Company, 1963).

therefore, it was concluded that higher noise intensities, typical of those found in vocational agriculture shops, do have a negative effect on reading comprehension.

2. There was a significant difference in the group mean scores for task completion times at different sound intensities. The students completing the reading task in the environment with a noise level of 55 dB(A) required significantly less time to complete the same test than the students in the environment with a noise level of 110 dB(A). Therefore, it was concluded that higher noise intensities, typical of those found in vocational agriculture shops, do have a negative effect on student performance with regard to the amount of time required to complete a task.

3. There was no significant difference recorded among the mean scores of the replications which made up the total mean scores for reading comprehension. The mean reading comprehension score of the students at any one of the six schools involved in the study was not significantly different than that of the total group mean scores. Therefore, it was concluded that the reading comprehension scores of the students did not differ significantly by school.

4. There was no significant difference recorded among the mean scores of the replications which made up the total mean scores for task completion time. The mean time required by the students to complete the reading test at any one of the six schools involved in the study was not significantly different than that of the mean time required by the total group. Therefore, it was concluded that the time required to complete the task by the students did not differ significantly by location.

Based on the findings and conclusions of this study, the following implications and recommendations are suggested:

1. In order to improve the learning environment, it is recommended that measures by taken to reduce the noise intensities in the school shop. Practices for reducing the noise intensities in the shop will vary from school to school. However, some suggested practices for reducing noise problems might be to: (a) Remove loud or high noise producing pieces of equipment from the learning environment. (b) Use acoustical treatment on the walls, floor and ceiling of the shop. (c) Use hearing protection devices such as ear plugs or ear muffs.

2. Major differences of performance did not exist between students of the six schools studied. Therefore, a recommendation is made that vocational agriculture instructors in every program should be concerned with and employ methods of controlling the noise intensities in the agricultural mechanics laboratory.